The Underdiagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD) in Young Females

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Abstract

- The gender differences in ADHD presentation is a topic that until recently has not been well studied or well understood.
- Research has shown that females are diagnosed for ADHD **less often** and **later in life** than their male counterparts, however the population-prevalence of this disorder is thought to be nearly the same between men and women.
- These diagnostic discrepancies between males and females highlight a need to answer the questions: **What factors influence the underdiagnosis of females with ADHD [P], what are the current diagnostic procedures [I] and what changes can be made [C] to create a more gender- and subtype-inclusive referral and diagnostic process [O]?**

Introduction

- ADHD is the most common neurologic disorder in children.
- ADHD is a behavioral disorder characterized by varying patterns of **inattention, hyperactivity** and **impulsivity** that may disrupt a child's daily functioning and development.
- According to NIH, one of the most difficult parts of diagnosing ADHD is that symptoms can be mistaken for emotional or disciplinary problems, misdiagnosed as other neurologic disorders, or even missed altogether if a child doesn't fit the typical patient profile.
- The current diagnostic modalities for ADHD include standardized scales, DSM V criteria and clinician judgement.

Methods

Literature Search

▪Performed in October 2019 using EBSCO and Google scholar

▪ Search Terms: "ADHD diagnosis OR attention deficit hyperactivity disorder diagnosis AND women OR girls OR gender OR sex."

▪ Inclusion Criteria:

1.Published in peer-reviewed journal
2.Published 2009 or later
3.Written in English

▪ Exclusion Criteria:

1.Systematic reviews or meta-analyses
2. Population of interest was adults
3. Population of interest was a specific subset of females such as incarcerated women or those with other comorbid disorders.

Results

1.Biederman J, Mick E, Faraone S, et al. Influence of gender on Attention Deficit Hyperactivity Disorder in children referred to a psychiatric clinic. *Am J Psychiatry*. 2009; 159(1). doi:10.1176/appi.ajp.159.1.36

▪ A cross-sectional study (n=522) that explored the discrepancy in male to female ratios in ADHD prevalence between clinic-referred populations (10 to 1) and community populations (3 to 1).

2. Meyer B, Stevenson J, Sonuga-Barke E. Sex differences in the meaning of parent and teacher ratings of ADHD behaviors: An observational study. *J Atten Disord*. 2017. doi:10.1177/1087054717723988.

▪ A cross-sectional study (n=153) that examined the role that parent and teacher ratings of ADHD symptoms play on the disparity between male and female childhood ADHD diagnosis rates.

3. Mowlem FD, Rosenqvist MA, Martin J, Lichtenstein P, Asherson P, Larsson H. Sex differences in predicting ADHD clinical diagnosis and pharmacological treatment. *Eur Child Adolesc Psychiatry*. 2019; 28(4):481-489. doi:10.1007/s00787-018-1211-3.

▪ A prospective longitudinal cohort twin study (n=19,804) that investigated sex differences in the severity and presentation of ADHD symptoms, conduct problems, and learning problems in males and females with and without clinically diagnosed ADHD.

4. Williams LM, Hermens DF, Thein T, et al. Using brain-based cognitive measures to support clinical decisions in ADHD. *Pediatr Neurol.* 2010; 42(2). doi:10.1016/j.pediatrneurol.2009.08.010

▪ A case-control study (n=350) that aimed to identify core cognitive markers of ADHD by measuring multiple domains of cognition in the hopes of creating a more objective diagnostic process.

5. Monastra V, Lubar J, Linden M. The development of a quantitative electroencephalographic scanning process for Attention Deficit-Hyperactivity Disorder: Reliability and validity studies. *Neuropsychology.* 2001; 15(1). doi: 10.1037//0894-4105.15.1.136

▪ A case-control study (n=126) that aimed to test the reliability and validity of using a quantitative electroencephalograph (QEEG) scan in the diagnosis of ADHD in children.

6. Bruchmuller K, Margraf J, Schneider S. Is ADHD diagnosed in accord with diagnostic criteria? Overdiagnosis and influence of client gender on diagnosis. *J Consult Clin Psychol.* 2012; 80(1). doi: 10.1037/a0026582

▪ A cross-sectional study (n=473) that investigated how accurately clinicians are using diagnostic criteria to correctly diagnose ADHD, and if gender influences their diagnosis.

7. Ohan J, Cormier N, Hepp S, Visser T. Does knowledge about Attention-Deficit/Hyperactivity Disorder impact teachers' reported behaviors and perceptions? *Sch Psychol Q.* 2008; 23(3). doi:10.1037/1045-3830.23.3.436

▪ A cross-sectional study (n=140) that aimed to investigate elementary school teachers' knowledge on ADHD and how this impacts their perceptions and reporting of children with ADHD.

Table 1. Significant findings.

Williams et al	Researchers found that Sustained Attention was the most sensitive and predictive marker for the correct diagnosis of ADHD. The researchers also found that using all five markers together, the **sensitivity was 88%, specificity was 91%, positive predictive value was 96% and negative predictive value was 88%.**	S (p<.001)
Monastra et al	Children with ADHD (both subtypes) had significantly greater theta-beta power ratios. The EEG-based diagnosis procedure had a **positive predictive power of 98%** and a **negative predictive power of 76%.**	S (p<.01) S (p<.01)

Discussion

Strengths

- Statistically significant results – 6/6 studies used p-value <.05
- Adequate sample size – 5/6 studies had n > 200
- Bias limitation – 5/6 studies included potential biases and mitigation measures taken

Limitations

- Study design – 4/6 studies were cross-sectional which represents a less robust study design.
- Study measures – Direct comparison between studies is difficult due to different study objectives and study measures

Future Research

- More research should be conducted on the accuracy, reliability, and cost-effectiveness of objective diagnostic tools for ADHD, including cognitive markers and EEG data.

Conclusion

- As with any childhood medical disorder, three important figures in a child's life that may first recognize symptoms are **parents, teachers and clinicians.**
- The first step in creating a more sensitive ADHD diagnosis is increasing awareness in these three groups so any biases, conscious or not, can be addresses and rectified.
- Making parents, teachers and even clinicians **aware of the gender-based diagnostic gap** that exists and educating them that ADHD is a complex disorder that **may present much differently than the "classic textbook case"** that they may be familiar with is a critical goal.
- Additionally, relying on subjective measures like questionnaires or clinician judgment alone has proven to be imperfect at identifying ADHD in children, therefore more **objective measures** for diagnosing ADHD, such as cognitive biomarkers or EEG measurements, are warranted.